Test 4 Formula Review

The symbols U, K, and Q may not be used on the solution side of the equation. The left side must only contain the asked for variable.

1. First Kinematic

$$\boxed{v = v_o + at}$$

2. Second Kinematic

$$\boxed{\triangle x = v_o t + \frac{1}{2}at^2}$$

3. Third Kinematic

$$\boxed{v^2 = v_o^2 + 2a\triangle x}$$

4. Kinetic Energy

$$\boxed{K_e = \frac{1}{2}mv^2}$$

5. Gravitational Potential Energy

$$\boxed{U_g = mg \cdot d}$$

6. Force of Gravity between two objects

$$\boxed{F_g = \frac{Gm_1m_2}{r^2}}$$

7. Centripetal Force

$$\boxed{F_c = m(\frac{v^2}{r})}$$

8. Acceleration due to gravity of an object

$$\boxed{a = \frac{Gm}{r^2}}$$

9. Formula for the energy of a spring mass when mass is sliding past equilibrium

$$\boxed{E = \frac{1}{2}mv^2}$$

10. Formula for energy of a spring mass when mass is at maximum displacement from equilibrium

$$\boxed{E = \frac{1}{2}kx^2}$$

11. Formula for total energy of a spring mass when spring is neither at maximum displacement or at equlibrium

$$\boxed{E = \frac{1}{2}mv^2 + \frac{1}{2}kx^2}$$

12. Three formulae for power

$$\boxed{P = \frac{W}{t}} \boxed{P = Fv} \boxed{P = \frac{\triangle K_e}{t}}$$

13. Formula for period of a pendulum

$$\boxed{T = 2\pi\sqrt{\frac{l}{g}}}$$

14. Formula for frequency of a mass on a spring

$$\boxed{F = \frac{1}{T}}$$

15. Formula for velocity of a wave

$$\boxed{v = f\lambda}$$

16. Formula for wavelength of a wave formed by a string if tension is known

$$\boxed{\lambda = \frac{1}{f}\sqrt{\frac{tension}{linear\ density}}}$$

17. Formula for fundamental frequency of a closed tube of length L

$$\boxed{f = \frac{v}{4\ell}}$$

18. Formula for fundamental frequency of an open tube of length L

$$\boxed{f = \frac{v}{2\ell}}$$

19. Two formulae for impulse

$$\boxed{J = Ft} \boxed{J = mv - mv_o}$$

20. Net force equations for the box in both locations

$$\boxed{-T - W = -m(\frac{v^2}{r})} \boxed{T - W = m(\frac{v^2}{r})}$$

M_2 is twice M_1 and v_2 is three times v_1. they move toward each other, collide and stick together.

21. Final velocity of the masses in terms of v_1 only.

$$M_2 v_2 - M_1 v_1 = (M_1 + M_2)v$$

$$(2M_1)(3v_1) - M_1 v_1 = (M_1 + 2M_1)v$$

$$5M_1 v_1 = 3M_1 v$$

$$\boxed{v = \frac{5}{3}v_1}$$

22. Find the heat produced in terms of M_1 and v_1 only.

$$K_e + K_e = K_e + Q$$

$$\frac{1}{2}mv^2 + \frac{1}{2}mv^2 = \frac{1}{2}mv^2 + Q$$

$$\frac{1}{2}(2M_1)(3v_1)^2 + \frac{1}{2}M_1(v_1)^2 = \frac{1}{2}(3M_1)(\frac{5}{3}v_1)^2 + Q$$

$$9M_1(v_1)^2 + \frac{1}{2}M_1(v_1)^2 = \frac{25}{6}M_1(v_1)^2 + Q$$

$$\frac{57}{6}M_1(v_1)^2 = \frac{25}{6}M_1(v_1)^2 + Q$$

$$Q = \frac{32}{6}M_1(v_1)^2$$

$$\boxed{Q = \frac{16}{3} M_1 (v_1)^2}$$

23. Formula for the velocity of a mass at the bottom of the incline without friction

$$\boxed{v = \sqrt{2gh}}$$

24. Formula for the heat produced when the box slides down the incline

$$\boxed{Q = mg\triangle y - \frac{1}{2} mv^2}$$

25. Acceleration of the box sliding down the incline (including friction)

$$\boxed{a = g \sin\theta - \mu g \cos\theta}$$

26. Formula for the acceleration of a mass sliding up an incline (including friction)

$$\boxed{a = g \sin\theta + \mu g \cos\theta}$$

27. Formula for Torque

$$\boxed{\tau = r \times F}$$

28. Three formulae for angular kinematics

$$\boxed{\omega = \omega + \alpha t}$$

$$\boxed{\triangle\theta = \omega_o t + \frac{1}{2} \alpha t^2}$$

$$\boxed{\omega^2 = (\omega_o)^2 + 2\alpha\triangle\theta}$$

29. Two formulae for torque when force is perpendicular to lever arm

$$\boxed{\tau = r \times F}$$

$$\boxed{\tau = I\alpha}$$

30. Newton's Second Law for rotational motion

$$\boxed{\tau = I\alpha}$$

31. Formulae for angular displacement, velocity, and acceleration

$$\boxed{\triangle\theta = \frac{d}{r}}$$

$$\boxed{\omega = \frac{v}{r}}$$

$$\boxed{\alpha = \frac{a}{r}}$$

32. Formula for rotational kinetic energy

$$\boxed{K_{rot} = \frac{1}{2}I\omega^2}$$

33. Work done by an applied torque

$$\boxed{W = \tau\theta}$$

34. Pressure exerted on an area A

$$\boxed{P = \frac{F}{A}}$$

35. Absolute Pressure

$$\boxed{p_{abs} = p_{gauge} + p_{atm}}$$

36. Gauge Pressure

$$\boxed{p_{gauge} = p_{abs} - p_{atm}}$$

37. Volume Flow Rate

$$\boxed{Q = Area \times v}$$

38. Buoyant Force

$$\boxed{F_b = \rho v g}$$

39. Density

$$\boxed{\rho = \frac{M}{V}}$$

40. Bernoulli's Equation

$$\boxed{P_1 + \frac{1}{2}\rho(v_1)^2 + \rho g \triangle y = P_2 + \frac{1}{2}\rho(v_2)^2 + \rho g \triangle y}$$

41. Force of gravity between planets P and Q

$$\boxed{F_g = G\frac{m_P m_Q}{d^2}}$$

42. The acceleration due to gravity on planet P is g. The mass of planet P is four times that of planet Q. The radius of planet P is twice that of planet Q. What is the acceleration due to gravity on planet Q?

$$\boxed{g_Q = g_p}$$

43. Exactly half way between the planets, will a baby gazelle have more/less/same force from Planet Q than from Plant P?

$$\boxed{Less}$$

44. Unit of power

$$\boxed{Watt}$$

45. Unit of force

$$\boxed{Newton}$$

46. Unit of work

$$\boxed{Joules}$$

47. Unit of angular momentum

$$\boxed{kgm^2/s}$$

48. Unit of universal gravitational constant, G.

$$\boxed{\frac{Nm^2}{kg^2}}$$

1. Centripetal Acceleration

$$\boxed{a_c = \frac{v^2}{r}}$$

2. Work Energy Theorem

$$\boxed{\sum W = \triangle K_e}$$

3. Spring Potential Energy

$$\boxed{U_s = \frac{1}{2}kx^2}$$

4. Newton's Second Law

$$\boxed{\sum F = ma}$$

5. Force of Friction

$$\boxed{F_f = \mu F_n}$$

6. First Kinematic

$$\boxed{v = v_o + at}$$

7. Kinetic Energy

$$\boxed{K_e = \frac{1}{2}mv^2}$$

8. Force of Gravity

$$\boxed{F_g = \frac{Gm_1m_2}{r^2}}$$

9. Third Kinematic

$$\boxed{v^2 = (v_o)^2 + 2a\triangle x}$$

10. Second Kinematic

$$\boxed{\triangle x = v_o t + \frac{1}{2}at^2}$$

11. Acceleration due to gravity

$$\boxed{F_g = \frac{Gm}{r^2}}$$

12. Torque

$$\boxed{\tau = r \times F}$$

13. Work

$$\boxed{W = F \cdot d}$$

14. Gravitational Potential Energy

$$\boxed{U_g = mg \cdot d}$$

15. Constant Velocity

$$\boxed{v = \frac{\triangle x}{t}}$$

16. Hooke's Law

$$\boxed{F = -kx}$$

17. Impulse including time

$$\boxed{J = Ft}$$

18. Heat generated on level ground

$$\boxed{Q_{level} = mg\mu d}$$

19. Linear Momentum

$$\boxed{p = mv}$$

20. Weight

$$\boxed{W = mg}$$

21. Forgotten Power Equation

$$\boxed{P = Fv}$$

22. Three more Power Formulae

$$\boxed{P = \frac{W}{t}}$$

$$\boxed{P = \frac{\triangle K_e}{t}}$$

$$\boxed{P = Fv}$$

23. Write the net force equation for the box of mass M shown below. It is coasting up the incline having a coefficient of friction μ.

$$\boxed{\sum F = -mg\mu\cos\theta - mg\sin\theta}$$

24. Write the COE equation for the situation show above

$$\frac{1}{2}mv^2 = mg\cos\theta\mu d + mg\triangle$$

$$\boxed{\frac{1}{2}mv^2 = mg\cos\theta\mu\frac{\triangle y}{\sin\theta} + mg\triangle y}$$

25. Heat generated on an incline

$$Q = mg\cos\theta\mu d$$

$$\boxed{Q = mg\cos\theta\mu dfrac\triangle y\sin\theta}$$

26. Weight in the x direction (on an incline)

$$\boxed{W_x = mg\sin\theta}$$

27. Energy mass equivalence

$$\boxed{E = mc^2}$$

28. The velocity of an object of mass m after coasting from rest at the top of a hill of height h.

$\boxed{v = \sqrt{2gh}}$

29. The maximum velocity of a car rounding a curve of radius r where the coefficient of friction is μ.

$\boxed{v = \sqrt{g\mu r}}$

30. The height ($\triangle y$) of a pendulum of length L if the angle θ is known

$\boxed{\triangle y = L(1 - \cos\theta)}$

31. Speed of light

$\boxed{3 \times 10^8 m/s}$

32. Range of human hearing

$\boxed{20Hz\, to\, 20kHz}$

33. Two formulae for angular momentum

$\boxed{L = I\omega}$

$\boxed{L = r \times mv}$

34. Impulse of a rotating object

$\boxed{J_{rot} = I\omega_1 - I\omega_2}$